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ABSTRACT

This speech first describes three activities conducted by the National Science Foundation's Women in Science Program. These are: (1) the Science Career Workshops; (2) the Science Career Facilitation Projects; and (3) The Visiting Women Scientists Project. Next, important issues to be considered for the future of these projects are presented. The issues cited are what kinds of science careers should women be considering, why is science considered a masculine field, how will the field change when more women become scientists, what can be done to increase scientific literacy for females, and what is the connection between ethnic minorities and women in science. (BB)

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The Role of the National Science Foundation

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to the
Conference on Expanding the Role of Women in the Sciences
of
The New York Academy of Sciences
and the
Association for Women in Science Educational Foundation
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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

Only yesterday--1976, to be exact--the Congress appropriated $1,000,000 with which the Education Directorate of the National Science Foundation was "to develop and test methods of increasing the flow of women into careers in science." This may strike you as a rather tardy response to the extremely gender-distorted career pattern characteristic of American science. Be that as it may, it represented an opportunity for the Foundation to get seriously to work on trying to rectify a situation that was becoming less and less tolerable: Less tolerable because it violated our gradually developing sense of equity, less tolerable because it condoned the under-utilization of our most valuable natural resource, that is, human intelligence, inventiveness and wisdom. In the first part of this paper I will sketch, quickly and impressionistically, how the NSF has responded to that opportunity by describing the array of current activities in our Women in Science Program. In the second part, I will present some of the issues that have emerged as we plan for the future.

Current Activities

The language of Congress in establishing the program was not specific. Since it left open the question of how to go about getting more women into science, the Directorate staff worked with the National Science Board's

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Committee on Minorities and Women in Science to develop a specific program strategy, which was then approved by the full Board. Three approaches were established: (1) Science Career Workshops to give women students in college information and practical advice about science careers and how to prepare for them; (2) Science Career Facilitation Projects aimed at getting women who already had some college science either back into science careers or into higher degree programs, and then jobs; and (3) a Visiting Women Scientists Project, targeted at high school students to encourage them to consider science careers.

Science Career Workshops

The workshops consist of one-or two-day sessions conducted by science departments or other units such as women studies centers, usually on college compuses. They draw college students, from about a 100-mile radius. At these workshop sessions, both on-the-scene and visiting scientists and job specialists from colleges, industry and government--mostly women--discuss career options and existing opportunities in all fields of science supported by NSF. Workshops may be at any one of four levels--freshman-sophmore, junior-senior, graduate, or post-education. The last type, which is new in 1978, will be for women who have at least a bachelor's degree in science, but are presently neither in graduate school nor employed in scientific jobs commensurate with their training. Naturally, the type of information and motivation provided varies from one level to another.

All indications are that these multidisciplinary workshops--46 of which have now taken place in 28 states and the District of Columbia--are doing what we had hoped they would in helping women students define science-related career goals. And there have been unexpected by-products: some apparent change in the attitudes of male faculty members who have participated, and new ties formed between women scientists in different science departments. We expect that the workshop experience will lead to some serious improvements at these colleges in the way of ongoing counselling regarding science careers.

Science Career Facilitation Projects

These projects go a step further. They are putting new polish on rusty degrees by helping women who have let their bachelor's or master's degrees in science lapse for from 2 to 15 years update their knowledge and either return to graduate school or get right into jobs. Placement is a prominent feature of all the projects--placments in jobs or graduate school.

The Science Career Facilitation Projects--11 were funded in 1976 and 10 in 1977--provide training in a broad spectrum of the sciences. This year, for example, three are in engineering, three in chemistry, two in interdisciplinary fields, and one each in life science and computer science. Within each general field, there is further variation. For example, Chatham College in Pittsburgh, is carrying out a project in industrial chemistry; Southern Illinois University is concentrating on food chemistry and environmental science; and the City University of New York is preparing 45 women to be systems analysts in areas related to their previous scientific

training. The relatively large number of projects in engineering and chemistry reflects our emphasis on training in fields where there is now an unusual underrepresentation of women and at the same time there are good job opportunities. The institutions receiving Facilitiation Project awards in 1977 are located in seven states and include three all-women's colleges and one minority institution. About 290 women are expected to participate in these 10 projects.

Some of these projects have been remarkably successful. At the University of Dayton, for example, there were only four dropouts from a group of 31 women--women with degrees in chemistry who were retraining for jobs in chemical engineering, and women with degrees in physics and math who were retraining to become electrical engineers. All 27 graduates had at least one job offer, and all but three are now working in the jobs for which they had been retrained. Two of the three who did not take jobs shortly after graduating did not do so because the jobs would have meant relocation. These results are not, we believe, unique. We are, however, having a third-party evaluation made of the Science Career Facilitation Projects to assess carefully their impact.

The Visiting Women Scientists Project

This Project, which is being carried out under contract by the Research Triangle Institute in North Carolina, is an experiment at the senior high school level. During the current academic year the Project is being carried out on a pilot basis with 30 women scientists visiting approximately 120 high schools throughout the United States. They will discuss the diversity of career opportunities and

the variety of alternative life styles that are available to young women seeking careers in science and technology. In addition to making presentations to large groups, the women scientists will be available to visit classes and meet with interested students, teachers, and counselors on an individual or small-group basis. Students and school staff members will also be given assistance in obtaining additional resources including pamphlets, films, and bibliographies for further study.

We do not yet know how feasible or effective this project will be in encouraging girls to consider careers in science, but already we have learned one thing: There is no difficulty in getting women scientists to serve as visitors. Over 600 women volunteered for the 30 available slots. This is reassuring testimony to the willingness of women scientists in America to help the next generation make informed decisions about their careers.

Issues

We are now into our third year of the Women in Science Program. Our appropriation for this year is the same as for the two previous years--approximately one million dollars. We are continuing--with minor modifications--the kinds of activities originally approved by the National Science Board. But we are taking stock and we are looking to the future.

We believe our program is having some positive effects and we know we are learning some things. However, as is the case for any kind of experiment, we are perhaps coming up with as many questions as answers. Let me briefly discuss some of the more important issues for the future--as we see them.

What Kinds of Science Careers for Women

As I look over the list of speakers at this Conference I note that most have the Ph.D. or M.D. degree. When we think about motivating young--or not so young--women to pursue careers in science, I suspect that many of us are thinking of ourselves as templates. This may be unwise for several reasons.

First, we can no longer argue that the doctoral degree is the best guarantee of employment. In all candor, I would have to tell the high school senior that today the woman with the new B.S. degree in engineering is far more employable than the new Ph.D. in biology. But I would also tell her that if she truly wants to be a biologist and will settle for nothing less than a job in academia, then she should get her undergraduate and graduate degrees in the best possible schools, get the best possible grades, do the best possible postdoctoral work, and then be prepared to take whatever academic job she can get.

Second, for persons with less than a doctoral degree, scientific and technical careers exist that can be rewarding for them and that can contribute significantly to society. A woman with a master's degree in physics teaching in a high school can serve as a magnet to girls who would ordinarily avoid a course in physics like the plague. A woman with a bachelor's degree in biology, some laboratory experience, and good writing skills can make a valuable contribution to a community by conducting environmental impact studies for a state government agency. These are only two examples of many that might be cited.

Third, many women--as well as men--with the intellectual ability to become Ph.D. scientists lack the incentive to do so. The high school sophomore whose parents' education ended with less than a high school diploma might be perfectly willing to contemplate six more years of formal education but would shrink in horror from the thought of 10 or 12 more years.

In my view, raising the level of aspiration of such a young woman from obtaining a high school diploma to a B.S. degree in science should not be counted as a failure, particularly if that degree means a better life for her than her parents had. And especially if there are practical ways for her to continue her scientific education later on if a positive career experience should lead her to raise her sights. Incidentally, the trend at the undergraduate level is reassuring. From 1965 to 1976 the proportion of bachelor's degrees in science and engineering went from 22 percent to 33 percent--a 50 percent increase. By comparison, for all fields combined the degree's awarded women went from 43 to 46 percent. As the undergraduate population approaches gender parity, the fraction electing science and engineering majors is escalating. The issue then is not whether, but how much, NSF should depart, in its efforts to increase the participation of women in science, from its traditional orientation to the Ph.D. degree, careers in research, and employment in academia.

The Rules of the Game

One of the reasons often given for the small number of women in science is that many women fear they will be labeled unfeminine if they study science

or pursue careers in science or engineering. The currently accepted way to deal with this is to try to persuade young women to overcome such fear and to prepare themselves to compete with men on men's terms. It implicitly assumes that science, a game whose rules have been largely made by men, is necessarily "masculine" in form and in substance.

But surely we ought at least to speculate on what might happen to those rules if science were to become less of a man's game. Would we have a different kind of science? Would research priorities, for example, be different? Would there be more concern with the social and economic consequences of science and technology? Would we find 60-hour weeks replaced by 30-hour weeks, as part-time employment became as attractive to male as well as to female scientists?

Would science--in short--become more humane? Would a humane science be less productive? Would a humane but less productive science be a better science?

I have no answers to these value-laden questions. I raise them only because we need to realize not only that science can do something for and to women, but women can do something for and to science.

Science Literacy

The next issue I wish to bring up has to do with a kind of participation in science different from the one we have been discussing. What I am referring to is an understanding on the part of all citizens, whether scientists or not, of what science and technology are, how they differ, what their relationships are to society, and what their potentials--and limitations--

are for solving the world's problems. A not very satisfactory term often used for this understanding is "science literacy."

We do not need to rely on the findings of the National Assessment of Educational Progress to realize that science literacy for females is less than that of males. We know that they take fewer courses in science and mathematics, read fewer science-related books and magazines, and are less involved in amateur science activities. But we also know that their need for science literacy is just as great. Perhaps even greater, for in a real sense I think we are dependent on women to raise the level of public decision-making in our society. All of the evidence indicates that from infancy onward females are more person-oriented than males, more inclined to caring, less to winning. These humane attributes are not, however, enough in a world based on science and driven by technology, scientific knowledge is also needed.

This is to say that for the sake of us all, it is urgent that the scientific literacy of all women be raised. And at the same time, a solid science education for women, irrespective of career preferences, can enhance their lives by helping them better come to terms with the natural world, and as a bonus expand their career options. In this regard I note with despair that the parents and schools of America still do not "require" girls to take mathematics to the same extent that they do boys.

It is for this reason, among others, that we are planning a major thrust at the junior high school level across all the divisions within the Education Directorate of the National Science Foundation. We see this

level of particular importance for minorities as well as women. It is here that sex differences in mathematics performance appear for the first time and where irreversible decisions regarding science careers may be made if science and mathematics course sequences are not entered or continued. Good science materials taught expertly at the junior high level can, we believe, have profound effects on the science literacy and science career decisions of all students, including the girls.

Distribution

The data indicate that the chief problem today is not the access of women into "science" but of women into particular sciences. If we look at college and graduate school enrollments, it appears that women are rapidly reaching parity in some fields, such as, for example, sociology, psychology, biology and anthropology. In chemistry, physics, astronomy, geology and mathematics, on the other hand, progress is slow. (Engineering shows a large percentage increase in women enrolling, but of course the absolute numbers are still very small since until recently the base was not impressively greater than zero.)

What is the policy issue in this for a government agency that wishes to increase the movement of women into science careers? Specifically, should we structure our Women in Science programs so that they provide incentive primarily for those women who want to go into the sciences in which women are severely underrepresented? Should recruitment efforts concentrate on those sciences?

Ethnic Minorities in Science

Generally speaking, I believe that linking two separate problems impedes achieving a good solution to either. But as my last issue let me raise the

possibility for your consideration that even though the difficulties associated with entry of women and the various ethnic minorities into science are quite different from each other, there is something to be gained from linking them in the following sense: Should we not try to bring the minorities into science with gender parity at the outset? And, in a complementary sense, should we not strive to bring women into science with ethnic parity at the outset? This is only to suggest that somehow women and the ethnic minorities ought to find a way to do better by each other than white men did by either.

In closing, I would like to acknowledge the outstanding job being done by Miss Joan Callanan in managing the Women in Science Program, and to thank her and Mrs. Anne Woodward, Office of Government and Public Programs of the National Science Foundation, for their help in the preparation of this paper.